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PYRETHROIDS:
NEW CONTAMINANTS IN HUMAN BREAST MILK

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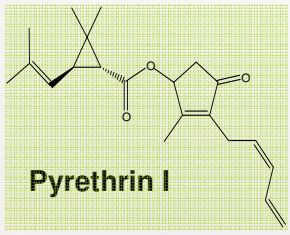
1.INTRODUCTION:

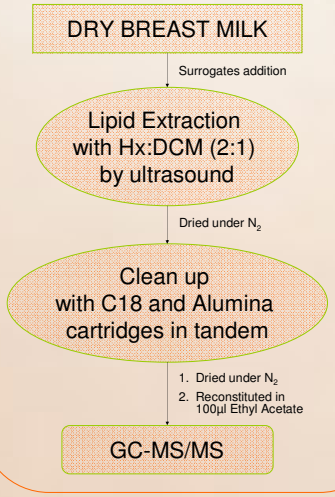
Pyrethroids are synthetic insecticides derived from pyrethrins, the natural ones. They contain at least 2 asymmetric carbon atoms, therefore they are found as enantiomeric pairs and diastereoisomers. These pesticides have replaced the organophosphorous used before. Nowadays, they are used as both domestic and agricultural insecticides. They show a low mammalian toxicity given the fact that mammals are able to metabolize them. There is a number of studies that identified their metabiolites, only few of them describe their direct presence in tissues, plasma or milk. Nevertheless, there have been some publications that aimed to address their toxicity in mice, with a special attention on stereospecific toxicity.



2.OBJECTIVES:

We study the occurrence and concentration levels of 12 pyrethroids in breast milk from different areas around the world. We try to describe differences between countries, considering both rural and urban areas, depending on the different commercial mixture usage. We look for isomeric differences in accumulation in order to determine potential isomeric-selectivity in human bodies. Finally, we calculate the Estimated Daily Intake (EDI) for a nursing and compare it with WHO's Acceptable Daily Intake (ADI).

3.METHODOLOGY:



4. ANALYTES and *Surrogates:*

1. Bifenthrin
2. λ-Cyhalothrin
3. Cyfluthrin
4. Cypermethrin
5. Deltamethrin
6. Esfenvalerate/Fenvalerate
7. Fluvalinate
8. Permethrin
9. Phenothrin
10. Resmetrhin
11. Tetramethrin
12. Tralomethrin

d_6-trans permethrin
d_6-trans cypermethrin

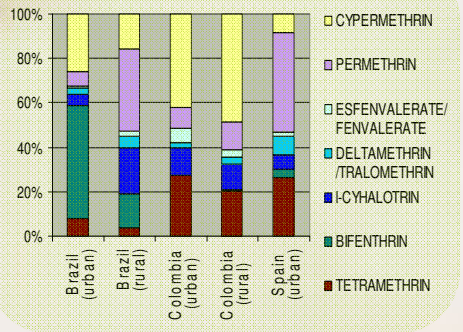
5. RESULTS:

Pyrethroids concentration in samples

(ng·g^{-1}(lw))

		Min	Max	Σ	σ
BRAZIL (2009/10) (n=17)	Urban	1.84	9.64	5.23	3.01
	Rural	2.73	19.10	9.54	5.68
COLOMBIA (2010) (n=27)	Urban	2.01	24.15	9.52	9.12
	Rural	2.01	23.46	9.15	6.34
SPAIN - BCN(2009) (n=6)	Urban	2.63	7.79	4.89	2.00
MOZAMBIQUE[1](2002)	Rural	87	1200	425	265
SOUTH AFRICA[3](2002)	Rural	5.0	19826	667	-

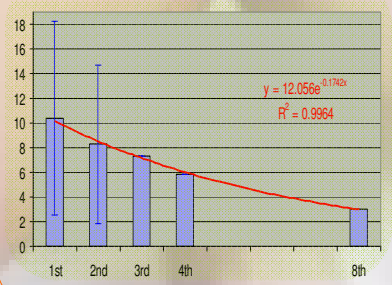
Contribution of each pyrethroid to the total



Estimated Dialy Intake (µg pyr · kg^{-1} bw ·day^{-1}) compared Accepteble Dialy Intake values

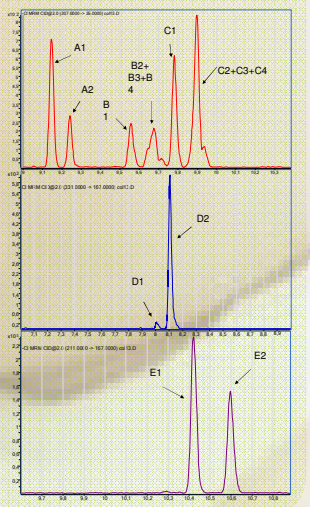
	BRAZIL	COLOMBIA	SPAIN	ADI[4]
Bifenthrin	0.00 - 1.33	0.00 - 0.30	0.00 - 0.33	4
Cypermethrin	0.21 - 1.80	0.78 - 4.60	0.07 - 0.25	20
Deltamethrin	0.00 - 0.16	0.00 - 1.30	0.07 - 0.27	10
λ-Cyhalothrin	0.00 - 3.90	0.03 - 0.96	0.02 - 0.21	5
Permethrin	0.03 - 1.38	0.00 - 3.19	0.99 - 1.66	50

ng/g (lw) de pyrethroid vs. number of children

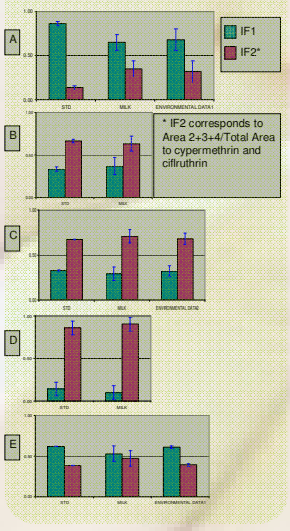


MRM Chromatograms, and isomeric characterization

A. Permethrin
B. Cyfluthrin
C. Cypermethrin
D. Tetramethrin
E. Fenvalerate/ Esfenvalerate



Isomeric Factor (Isomer Area / Total Area)



6. CONCLUSIONS:

- **Pyrethroids are present in human breast milk.**
- **Our results are less threatening than those from malaria zones where pyrethroids were massively used for some time.**
- **Different patterns were observed depending on the country, so the typical commercial mixtures clearly influence the pattern.**
- **According to the WHO criteria, the measured values are safe for human health.**
- **An exponential decay of the concentration levels of pyrethroids in the milk with increasing number of children was observed.**
- **With a few data on the isomeric characterisation of the environmental samples that could be found in the literature, it is very difficult to draw a firm conclusion on the isomer selective accumulation of pyrethroids. In this study, no isomer selectivity in human body could be observed.**

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